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Theme session Report

A region to be managed: The case of the Bay of Biscay and the Iberian Coast under environmental and socio-economic stressors.

Conveners: Arantza Murillas (Spain), María Gómez Ballesteros (Spain)

Content

The Bay of Biscay (Bob) and the Iberian Coast (IC) ecoregion, which covers the southwestern shelf seas and adjacent deeper eastern Atlantic Ocean waters of the EU, faces some management and governance challenges to be dealt over the coming years to ensure the sustainability and provision of the services offered by this ecosystem (that is, provisioning, regulating and cultural ecosystem services). The EU's Maritime Spatial Planning Directive (MSPD) calls on Member States (MS) to promote Blue Growth while maintaining the good environmental status (GES) of maritime areas. The European Commission goes in the same direction introducing a new approach to advance towards a so called **Blue Sustainable Economy** (COM 2021).

However, the governance of this ecoregion is fragmented into different uses -shipping, oil and gas, renewable energies, fisheries, tourism, etc. -which are in many cases managed as separate units. **To ensure that human activities are compatible with the conservation of marine ecosystems and inhabiting species a detailed spatial-temporal knowledge of both the marine ecosystem and the human activities is needed**. This is especially relevant in the Bay of Biscay and around the Iberian Peninsula, where due to the limited extent of the continental shelf the demand for space for human activities is critical. **Session O specifically focuses on marine fishing sector activity.** Research organizations are heavily working to enhance the new knowledge around the spatial-temporal knowledge of the activity providing ***assessment of fishing performance and climate change impacts on the Bay of Biscay through a spatiotemporal ecosystem fisheries management approach. Distribution models are also presented during the session to inform the management of marine ecosystem from the Bay of Biscay***.

However, **adopting a Blue Sustainable Economy approach also implies understanding the environmental status** in the Bay of Biscay and Iberian Coast by providing knowledge of **the most important pressures and possible impacts linked to the fishing,** among other economic activities. Reason why session O offers information **about new indexes *to measure fishing pressures in the habitat, in particular, a universal method applied in the Bay of Biscay*** considering the most relevant fishing *metiers* operating in this marine ecoregion. Other pressures to be considered are the introduction of contaminating compounds, the introduction of non-indigenous species, greenhouse gas emissions, noise, and marine litter. Session O introduces specific research outcomes ***to assess and quantify variations in the functioning of marine food webs, and other research on climate warming, which induces shifts in macroalgal communities in the south-eastern Bay of Biscay.***

All this, in a framework of global change, particularly significant in this region located in the south of Europe where it might cause the regression of cold-water species, the incursion of subtropical species and the rise in sea level might affect the key stocks status. ***Session O turns to cover assessment models for some specific stocks. Take for instance, the alternative HCRs for a short living stock using an MSE framework, using, the case of the anchovy in the Gulf of Cadiz. Dynamic harvest control rules based on recruitment levels to manage stocks of uncertain***

productivity, with application to Iberian sardine. Finally, providing understanding about the mechanisms behind the decline of anchovy size in the Bay of Biscay.

Session O equally shows how current research emphasizes the increasing necessity of introducing economic studies following a multidimensional approach also required to advance towards the blue sustainability of the fishing sector. ***Assessing the economic costs and ecological benefits of spatial protection measures for the case study of SCI Avilés Canyon System and, identifying the drivers that influence the price of Anchovy in Basque Country*** represent some of the examples of research works in this ecoregion.

Finally, session O clearly emphasizes this ecoregion needs scientific knowledge from previous models but also, **local knowledge of stakeholders ´views and, perceptions which add to the previous knowledge an understanding of the management ecoregion. Session O introduces as an example, research on priorities of the deep-sea ecology in the Bay of Biscay for which a set of surveys to the key multi stakeholders were developed.**

Conclusions

The title of this session identifies the main aim of it "A region to be managed….". Session O allows us to state the scientific knowledge is huge and, rapidly advance offering a high number of studies, mostly oriented to environmental aspects but also, trying to introduce economic and social issues. However, we state that **institutional innovation is required by engaging in the ecoregion management a good number of policy makers and stakeholders.** From our synthesis of the research outcomes presented in this session O, a major effort for institutional innovation is still needed, following and ecosystem-based approach to fishing management. **Most of the outcomes presented here are not currently linked to final users, including policy makers, – except for some stock-based management rules –, which means, in our view, it is still necessary to further build up research outputs in stakeholder participation and engagement at, and across, all local, regional or national levels at this marine ecoregion.**

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CM 148: Westward movement of anchovy landings in the Bay of Biscay: implications for the Spanish fishery

Marga Andrés, Leire Ibaibarriaga, Andrés Uriarte, Raúl Prellezo, Sonia Sánchez-Maroño

Anchovy (*Engraulis encrasicolus*) in the Bay of Biscay is an important economic resource exploited by French and Spanish fleets. Catches of the French fleet have decreased sharply in the last years representing only 0.4% of the international catches (mean 2020 and 2021), while in the previous decade this percentage ranged from 8% to 44%. Catches of Spanish fleets, in turn, have increased gradually from 2010 to 2021. Anchovy landing ports in Spain are located on the four regions of the Cantabrian coast: Basque Country (east), Cantabria (middle east), Asturias (middle west) and Galicia (west), being the ports of the Basque Country the main historical landing ports (accounting on average about 72% of the anchovy landings between 2010 and 2019). However, since 2020 several changes have been observed in the Spanish fishery: the spatial distribution of the catches has shifted to the west, whereby there has been an increase of landings at the middle and western ports along with a decrease in the Basque Country ports (accounting nowadays for only 11% of the Spanish catches). This behavioural change affects the fleets in each region differently. The fleets further east, such as Basque fleets, are extending their fishing trips, and landing, out of their base region, whereas the contrary happens to the fleets further west. Consequently, the Basque fleets have had to face an increase in fuel and other variable costs while the rest of the Cantabrian fleets may even have benefited from these changes in catch and landing patterns. Simultaneously, in the last years the anchovy sales composition by size has changed towards smaller anchovies. While large anchovy represented around 99% of the sales in years 2013-2014, this percentage has dropped to 71% in recent years (2020 - 2021) and the percentage in Basque ports has dropped even more (up to 28%). Given that the price of anchovy is positively correlated with its size, the average price of the anchovy sales has decreased in the Basque Country, with an opposite trend in the westernmost regions (Asturias and Galicia). Therefore, the Basque Country is facing both an increase of costs and a decrease of profits; the point is that the fleet will pursue anchovy as long as the fishery is profitable, how far? This study addresses this question considering several variables as the size of the anchovy, price, fuel consumption, fuel price and variable costs.

Keywords: Bay of Biscay, anchovy, westward, fleet behaviour

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CM 159: Opportunistic species, myth or reality? Bottom trawling impact on species of low sensitivity in the Bay of Biscay

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Bottom trawling is one of the major anthropogenic impacts on benthic communities and habitats in both extension and intensity. In this context, there is a growing interest on developing methodologies to obtain a precise estimation of the current state and quality of benthic habitats, considering them an essential tool for the management of marine ecosystems. Recently, the total biomass of the community emerged as one of the indices that best explains the direct impact of bottom trawling on benthic communities, ignoring however the potential positive impacts on opportunistic species by considering that these changes are mainly a temporary phenomenon. This work aims to analyse and provide relevant information about the relationship between opportunistic species and bottom trawling, in order to better understand its impact on total community biomass. The squat lobster Munida spp. represents a good example of such opportunistic behaviour. Here we used a part of the historical series of the Spanish International Bottom Trawl Survey 'DEMERSALES' (2013-2020) to analyse the influence of environmental and anthropogenic variables (i.e. bottom trawling) on the spatial distribution patterns of Munida spp. The results showed a strong and significantly positive relationship between bottom trawling and the abundance of Munida spp. (opportunistic response). This response was widespread distributed in the southern Bay of Biscay across all the studied period. The results of this works highlight the importance of including sensitivity indices before using total community biomass as an indicator of trawling impact.

Keywords: bottom trawling, opportunistic species, GAM, benthic habitats, species distribution models, Munida spp.

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CM 161: Scale matters: assessing and quantifying variations in the functioning of marine food webs using a spatiotemporal approach

Preciado I.[1], López-López L., Rabanal I., Ortiz J.J., Torres M. Á., Muñoz I., García E., García-Aguilar O., García Rebollo J. M., Garrido S., Iglesias D., Le Loc'h F., Mendes H., Metaireau H., Parra Z., Serre S., Valls M., Vivas M.

Marine food webs represent the most elemental structure of the ecosystem, as they evince the main pathways of energy flow through ecosystems illustrated by the consumer-resource interactions among organisms (from primary producers to top predators). The knowledge of the functioning of these networks is therefore key for the understanding of marine ecosystems functioning. However, the spatial resolution at which ecosystems are analysed may obscure crucial processes in their functioning, leading to erroneous conclusions, with important implications for management and governance.

In the present study, we used the food web indicator Mean Trophic Level (MTL), encompassing an entire bentho-demersal community and including as many species as possible (i.e. fish, cephalopods and other invertebrates). The indicator has been calculated using regional Trophic Levels (TLs) of species whenever possible. The MTL was developed at two spatial resolutions, (sub) regional and local (0.2 x 0.2 cells), aiming at evaluating the sustainability of fisheries practices of past decades in four (sub) regions of the Bay of Biscay (BoB) and Iberian coast. A set of 18 ecological scenarios based on different TL cut-offs and depth ranges were established for each (sub) region, and linear models were applied to the historical series (2000-2021) for each of the scenarios. Based on the slope and number of years, the rate of change of the indicator was classified into three categories: increasing, stable and decreasing.

Results at (sub) regional level showed signs of recovery of top predators (TL>4) in the northern BoB, in contrast to the generally observed decrease in Portuguese and Spanish Iberian coast. When including mesopredators (TL>3.25) in the calculations, increasing trends were observed in most of the monitored (sub) regions. Nevertheless, when the trends were plotted by 0.2 x 0.2 cells, certain small-scale temporal changes appeared that were previously masked when the indicator was calculated by (sub) region. These contrasting trends highlight the importance of the spatial resolution when assessing the status of marine food webs, as well as the need to consider different bathymetric ranges and ecological scenarios in the development and assessment of indicators.

Keywords: food web indicator, fishing pressure, MSFD, mean trophic level, spatiotemporal approach

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CM 179: Baseline fuel consumption and carbon footprint during the Bay of Biscay albacore season

Castresana J.[1], Caballero A., Anabitarte A., Gabiña G.

Nowadays, there are different type of measures to reduce the fuel consumption, ready to be applied to the fishing fleet and activity. For validating the effectiveness of these measures and adapt them to the different fleets, it is necessary to first know their fishing procedure and the historical fuel consumption and carbon footprint. This way, based on the results of each fleet, different approaches could be applied. This is the objective of this study, i.e., to build a baseline information of the previous historical information for two fleets during the albacore (*Thunnus alalunga*) fishing campaign. Since the fishing procedure of these two fleets are different, the specificity of each of them (e.g., distribution, timing) has been considered. For that aim, a VMS time series from 2009 to 2021 has been compiled and processed for 40 different vessels of the Basque fleet, employing trolling line fishing (LTL) and pole and line fishing (LHP).

The results of the **operative pattern** analysis of both fishing strategies have shown that LTL vessels spend most of the time in speeds between 6-9 knots (fishing or steaming), while LHP are mostly between 0-1 knots (fishing) and 8-11 knots (steaming). Regarding the fishing seasons, their duration has decreased since 2009 to date, being LHP seasons shorter than LTL seasons. For instance, in 2015 LTL and LHP seasons lasted an average of 124 and 89 days respectively, while in 2021 they needed 73 and 61 days. Aiming to assess the energy efficiency of both fishing gears, the **fuel use intensity** (FUI, L fuel/tn catch) has been calculated for each season and fishing gear. The mapping of the fishing trips revealed that, while LHP vessels' trips have been concentrated on the eastern zone of the Bay of Biscay, LTL have shown a trend to carry out longer fishing trips towards western zones in the start of the seasons (May-June) in the last years that has led to increased FUI values. Nevertheless, FUI values of both gears have decreased over the years, keeping constant since 2017 in agreement with their **carbon footprint**. As a reference, in 2021 their average FUI and carbon footprint ranged between around 310 to 590 L/tn and 850 and 1600 CO_2/tn catch, respectively.

This characterisation of the **operative pattern** (time-distance-speed while fishing/steaming) resulting in different fuel consumption (L fuel/h) and carbon footprint (CO_2/tn catch) gives clues on potential efficiency measures (FUI) for each of the fleets.

Keywords: fuel consumption, GHG, carbon footprint, environmental impact, albacore, Bay of Biscay

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CM 185: Evolution of demersal marine communities over a 25-year period in the North Bay of Biscay

Dorothée Kopp[1], Marie Morfin, Robin Faillettaz, Julien Simon, Fabien Morandeau, Ludovic Bouché, Pierre Le Bourdonnec, Sonia Méhault

Marine ecosystems are facing pressure both from climate change and anthropogenic activities. While the induced impacts are widely observed, studied, and modelled to define projections and management advice, the evolution of marine biodiversity still needs to be described and understood at local scales. The northern part of the Bay of Biscay is particularly concerned since at the edge of two marine provinces that discriminate lusitanian and boreal species, and with intense fishing pressure from the French demersal fishing fleets due to the presence of commercial fish, crustaceans, and molluscs. In the late nineties, a scientific survey characterized the demersal biodiversity of this area using underwater video transects. 25 years later, the same transects were revisited using a ROV. The species richness and densities from these two campaigns were compared to describe and detect changes in marine community composition and to highlight potential shifts between lusitanian and boreal species. Despite intense fishing activity in the area over the past decades, the species richness remains stable with 38 taxa in 1996, 39 in 2021 and 37 in common. However, some Lusitanian species (e.g., *Capros aper* or *Microchirus variegatus*) have significantly expanded and increased in density. These results tend to suggest that the demersal community of this region suffers from climate change more than from fishing pressure.

Keywords: species richness, abundance, temporal variations, video, Bay of Biscay

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CM 192: Assessing fishing and climate change impacts on the Bay of Biscay through a spatiotemporal ecosystem modeling approach

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Over the last decades, the Bay of Biscay (BoB) ecosystem has experienced changes in species distributions and abundances caused primarily by intense fishing activity and climate variability and change, with uncertain futures even under the most conservative climate scenarios. Fishing reductions and diverse spatial management measures have been implemented in recent decades to rebuild marine resources and protect and restore ecosystems. In addition, the European Commission has recently declared several bottom fishing closures to protect vulnerable deep-sea habitats. However, the combined effect of fishing reductions and closures is largely unknown due to the lack of comprehensive analyses in the region.

Marine ecosystem models (MEMs) such as Ecopath with Ecosim (EwE) can provide essential insights to guide decision-making process to achieve sustainable goals by informing about potential outcomes of combined management options and climate change. In this study, we developed a spatiotemporal EwE model for the BoB, covering the ICES subdivisions 8abc up to 1000 meters depth, for the years 2003-2050. The model incorporates historical fishing effort, fishing mortality and environmental factors (sea surface and bottom temperature and primary production). Historical (2003-2019) and plausible future (2019-2050) scenarios of climate change, which corresponds with Shared Socioeconomic Pathways (SSP) 1, 2 and 5, were obtained from an ensemble projection through the FutureMares project of Earth System Models under CMIP6 (Coupled Model Intercomparison Project) climate scenarios. The model assesses during the historical period the differences with and without current spatial measures. Then, projections to the future include the assessment of the impacts of the new bottom fishing closures under different climate trajectories considering historical fishing dynamics.

Our results confirm that fisheries management measures have contributed to the observed recoveries of several commercial species. However, the increasing impact of climate change could jeopardize the benefits of fishing reductions for some recovered target species (e.g., European hake) and could have detrimental impacts on several target species already impacted by ocean warming (e.g., European sardine). Our results also highlight the limited impact of spatial management measures to date and their continued limited effectiveness for plausible futures. The model represents a step forward in the implementation of an ecosystem-based management advice at a regional scale.

Keywords: spatiotemporal food web model, fishing impacts, spatial management measures, climate change

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CM 238: Marine spatial planning to solve increasing conflicts in the Grande Vasière: a framework for prioritizing offshore windfarms and marine protected areas in a fisheries-dominated socio-ecosystem

Marie Morfin[1], Germain Boussarie, Gaël Lavialle, Dorothée Kopp, Maud Mouchet

The Grande Vasière (GV) covers most part of the Northern part of the Bay of Biscay, and is the place of anthropogenic activities, especially fishing, and will soon shelter sand extraction activities and offshore windfarms (OWFs). These activities exert varying pressures on habitats, biodiversity, and subsequent ecosystem services (ES). Marine Protected Areas (MPAs) can limit these pressures by restricting human activities, but their implementation would all the more increase the competition for space. Furthermore, they are often implemented in arbitrarily chosen areas, large and remote to reach a percentage of area under protection. As a result, low biodiversity and ES outcomes are generally observed, and acceptability of OWFs and MPAs is usually very low in such fisheries-dominated socio-ecosystems, partly due to an underrepresentation of fisheries in spatial plans and poor attention to equity in the spatial distribution of restrictive areas.

To address these issues, we developed a flexible and inclusive Marine Spatial Planning framework relying on: 1) the mapping of the relevant indicators of biodiversity and ES, 2) the mapping of the values that represent the area for each fishery, and 3) the use of a prioritization algorithm to explore siting scenarios of OWFs and two types of MPAs (benthic and total protection), aimed at conserving biodiversity, regulating and provisioning ES, while also ensuring that fisheries are equitably impacted.

We demonstrate that equitable scenarios are not necessarily costlier and provide alternative spatial prioritizations. We emphasize the importance of exploring multiple targets with a Shiny app to visualize results and stimulate dialogue among stakeholders and policymakers. Overall, this framework could be an ideal discussion tool to improve management practices.

Keywords: marine spatial planning, ecosystem services, fisheries, offshore windfarms, marine protected areas, biodiversity, Bay of Biscay

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CM 256: Measuring fishing pressures in the habitat: a universal method applied in the Bay of Biscay

Eneko Bachiller[1], Maria Mateo[1], Antonio Punzón[2], Estanis Mugerza[1], Arantza Murillas[1]

Different fleet segments depend on and compete for coastal and marine ecosystems. Conflicts of use and impacts on marine biodiversity need to be addressed to move towards ecosystem-based management and maritime spatial planning. However, few integrative methodologies exist for the cumulative impacts of fleet segments and therefore the goal of balancing sustainable fisheries and protection of marine ecosystems remains unresolved. This study develops a methodology based on a multidisciplinary index linking fishing gear pressures from different fleets and impacts on the marine and coastal habitats. These environmental stressors are physical (e.g., habitat degradation, fuel consumption, marine litter), biological/ecological (e.g., degradation of protected habitats, bycatch of protected species) and fishing-derived (e.g., enforcement of landing obligation, discards, conflicts with other gears, loss of fishing gears). Building a common habitat-risk matrix based on local expert knowledge, the method quantifies and maps different sources of impact that each fishing gear exerts on marine habitats, based on empirical fishing activity and landings data, with high spatial resolution. Further, the matrix makes it possible to operationalize the estimation of potential risk for any fleet from other regions. In this case the approach is applied to fisheries with base port in the Basque Country and operating within the Bay of Biscay in 2021, including a wide range of fleet, from small scale to large scale fisheries, to determine if certain areas are under high risk of impact by fisheries, and to what extent such impacts come from specific fleets or métiers. Results show that, for instance, bottom otter and pair trawlers can cause relatively higher impacts than other gears, but such impacts are mainly concentrated along the French continental slope. In contrast, trolling lines targeting albacore seem to exert relatively lower direct pressures, but their impacts are extended all over the oceanic region of the Bay of Biscay and are more related with fuel consumption and bycatch of non-commercial species. This method is a simple and understandable tool that allows comparing and classifying the fishing gears, based not only on different potential impact sources but also on their spatial distribution, which might be helpful for different types of stakeholders (researchers, managers, officials, fisheries sector representatives, NGOs, etc.) with different professional backgrounds (e.g., researchers vs. fisheries sector) and expertise (e.g., scientific vs. empirical).

Keywords: fishing impact assessment, habitat risk, fishing gear, fishing effort, spatial distribution

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CM 298: Operational patterns of small-scale fishing vessels from an energy efficiency perspective

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Reducing fuel consumption brings a wide range of benefits, having a positive impact on atmospheric pollution, the marine environment, and public health, as well as reducing operational costs and helping to make fishing a more sustainable sector. In the search for such energy efficiency, it is first necessary to characterize the activity of the vessels, with high variety of gears and operatives (e.g., gillnets, trammels, longlines, trolling lines, hand lines, pots, etc.) in the case of small-scale fishing vessels, and deal with the subsequent energy efficiency proposal. This scale of vessel could be an opportunity to assess an engine or propulsion system modernization approach due to the low distance travelled or energy demand needed per fishing trip.

The aim of this study was to describe the fishing activity of various small-scale fishing boats distributed throughout the different ports of Basque Country, Spain, and obtain vessel operational profiles in order to evaluate the possibility of energy efficiency improvements and strategies (e.g., propulsion system modernizations, etc.). To do this, we will work with data from the period 2020-2022 from the Vessels Monitoring System (VMS), Automatic Identification System (AIS), and Global Positioning System (GPS) data provided to ships. Based on this location and speed data, we mapped and analysed the data, obtaining results for miles travelled per month, average speeds per month, and fishing areas covered per month.

The preliminary results revealed different fishing operational patterns. On most days, vessels have daily trips in coastal areas, and thus have the possibility of energy efficiency improvements (e.g., electrification with daily recharging batteries, etc.). However, it should be noted that some ships have trips of more than one day during some months (e.g., albacore tuna season). This can be a limitation when considering for example hybridization or electrification, and these patterns should be analyzed more thoroughly, for instance, by installing technology on board to obtain more relevant and detailed vessel and engine performance data, such as vessel speed profiles, travelled distances, engine regime, instantaneous fuel consumption, etc.

The study will report different data on small-scale fishing boats, such as the fishing operational profiles of such fleet segment, which will be interesting for the future electric-hybridization propulsion approach, and it can be a principle for other fleet types.

Keywords: Energetic efficiency, Spatial analyses, Artisanal fishing boats, Bay of Biscay

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CM 308: Extreme values of satellite chlorophyll-a and HABs in the Bay of Biscay between 2003 and 2021

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The occurrence of extreme chlorophyll-a values is related to intense phytoplankton blooms that may entail higher productivity rates or adverse events such as eutrophication or toxic events produced by Harmful Algae Blooms (HABs).

Two novel, complementary and non-overlapping statistical extreme indices combining the 90th percentile (P90) and the monthly 90th percentiles (mP90) from the satellite MODIS-AQUA v2018 reprocessed dataset, for the period 2003-2021 in the Bay of Biscay have been calculated: The "Extreme Highest" (EH) exceedances (bigger than P90 and mP90) and the "Extreme Anomalous" (EA) (bigger than mP90 and lower than P90). EH gather the extreme observations mostly produced during the interannual spring growing season, whereas the EA exceedances are found during low phytoplankton growing periods. This last index reflects different types of extreme events such as unexpected episodic anomalous blooms, extreme values occurring during the autumn secondary seasonal bloom, or extremes registered earlier or later than the expected spring season timing. Our results show that EH prevail in coastal areas of the Bay of Biscay, but the EA prevail in offshore areas. While EH are observed from February to May, coinciding mainly with the late winter and spring bloom, the EA are recorded in summer-autumn months (June to November) as well as in January. Statistically significant increasing yearly trends are observed for EA in offshore areas. These results suggest the effects of the strong variability of the oceano-meteorological conditions that affect the Bay of Biscay during the last decades. A comparison between the EA events and the toxic HABs episodes registered in the Basque coastal waters (SE corner of the Bay of Biscay) has been made to address the relationship and correlation between the EA and different types of HABs.

This research is co-supported by various projects: GES4SEAS ("*Achieving Good Environmental Status for maintaining ecosystem SErvices, by ASsessing integrated impacts of cumulative pressures";* Horizon Europe grant agreement no. 101059877;), OBAMA-NEXT *("OBserving And MApping marine ecosystems – NEXT generation tools"*; Horizon Europe grant agreement ID: 101081642;) and BIOTOX *("Exploración de alternativas para minimizar el impacto de los cierres derivados de los eventos de biotoxinas en la Zona de Producción de Moluscos de Mendexa";* FEMP 00002-INA2021-33)

Keywords: Bay of Biscay, extreme chlorophyll-a, Harmful Algal Blooms, climate change, marine biotoxins

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CM 309: Integration of different types of indicators for assessing adverse effects on benthic habitats

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Ecological indicators are key tools to monitor and assess seabed integrity and manage anthropogenic activities under the EU Marine Strategy Framework Directive (MSFD). However, so far, no indicator can meet all the MSFD requirements since everyone possesses, whatever their type of method (risk vs. sampled-based indicators), caveats, limitations, and knowledge gaps. Therefore, indicators should be seen as complementary, being necessary a combination of individual indicators to assess the benthic habitats state under D6 properly. Here, we propose the integration of two OSPAR indicators, the BH1 and BH3, to assess the state of benthic habitats in response to bottom trawling. The BH1 (also called SoS) is a sample-based indicator that measures the proportion of sentinel species within each habitat as a proxy for its environmental status. It requires detailed monitoring data across the pressure gradient of each habitat assessed to determine the environmental status based on pressure-state curves. This need for quality data reduces uncertainty but creates spatial gaps in the assessment. The BH3 is a risk indicator that determines the overall impact on each habitat based on a theoretical disturbance matrix. It allows the evaluation of large marine areas where only limited data are currently available by extrapolating data and knowledge from local studies. Therefore, the evaluations of BH3 see their uncertainty increase concerning BH1 but cover the gaps that BH1 does not. In the Spanish approach to evaluating MSFD Descriptor 6 (seafloor integrity), we plan to use the complementary assessment of both indicators, nested by their type of method, to reduce evaluation uncertainties and spatial gaps. Specifically, this new approach tested for the Bay of Biscay uses the BH1 pressure-state curves to calibrate or ground-truthed the BH3 pressure-state relationships that underpin the disturbance matrix categories. This approach will allow us to assess the state of some MSFD broad habitat types and other habitat types (e.g., where only limited data are available) in response to trawling that independent indicators could not evaluate with an ecological sense. Although the integration proposed here uses the BH1-BH3 tandem, other indicators could be used similarly to provide a broader range of evidence.

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Keywords: indicators, trawling disturbance, pressure-state curves, MSFD, D6, ecological quality thresholds

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CM 316: Distribution models to inform the management of marine ecosystems. A perspective from the Bay of Biscay

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Distribution models, also called species distribution models, habitat suitability models or ecological niche models are a group of correlative models which aim to predict the spatial distribution of the response variable (usually the probability of presence of one species) based on a set of explanatory variables available in a georeferenced format (usually a raster). These models have a growing importance in the management of marine ecosystems since they allow to map the distribution of species and habitats, a key step in the implementation of the ecosystem approach and the different legislative tools developed with this purpose (e.g. Habitat Directive, Marine Strategy Framework Directive (MDFD), Marine Spatial Planning Directive or the currently under development "Restoration law"). Furthermore, the spatial framework developed for these models is also a good umbrella to develop spatial approaches, to assess habitat quality and to evaluate anthropogenic impacts. In this work, we will show some examples of the application of these models to manage the marine ecosystems of the Bay of Biscay during the last decade such as: map the distribution of Vulnerable Marine Ecosystems to inform to the development of Marine Protective Areas and other spatial measures (VME closures), predicting the distribution of essential fish habitats, assessing the impact of bottom trawling on benthic habitats (in the frame of the descriptors 6 and 4 from the MSFD), map the distribution of marine litter or estimating the impact of climate change on species and habitats. Furthermore, we will discuss some of their main limitations, current hurdles currently faced for its implementation on ICES advice and some reflections on potential future lines of research within the Bay of Biscay and beyond.

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Keywords: Marine Spatial Planning, Distribution models, Habitat suitability, Ecological niche, bottom trawling, benthic habitats, Bay of Biscay

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CM 368: Trophic heterogeneity: a new indicator to assess the health of Mediterranean marine food webs

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Human pressures are causing significant changes on marine ecosystem functioning. In particular, it is well known that fishing pressure strongly alters the food webs' structure, disrupting the energy flow through marine ecosystems and reducing the network complexity by simplifying trophic interactions. It is therefore necessary to monitor the loss of food web complexity through effective indicators, improving our capacity to assess the marine ecosystem health.

Up until now, the research community has widely relied on trophic indicators such as the Mean Trophic Level (MTL) to assess changes in the average trophic level of disturbed food webs. Nevertheless, this well-accepted indicator which strongly responds to fishing pressure, describes the average trophic level of a particular food web, but in doing so, it obviates many other characteristics of the trophic spectra of marine communities, which typically follow non-parametric distributions. In this sense, trophic heterogeneity, calculated as the coefficient of variation of trophic levels within a community, complements MTL by providing an estimate of the trophic spectra width and shape, which is representative for non-parametric distributions and comparable across ecosystems. The combination of two these aspects; average trophic level and trophic heterogeneity, can help improve the assessment of the food web status, providing a more comprehensive view on the marine ecosystem health.

To this end, in this study we have analysed the changes over time of these two food web indicators (MTL and Trophic Heterogeneity) in the Western Mediterranean marine ecosystems. The analysis was performed according to 12 different scenarios; 3 TL cut-offs (TL≥2, TL≥3.25 and TL≥4), 2 depth ranges (continental shelf and slope) and lastly, based on all community or without considering pelagic species. For each of these scenarios, Linear (LM) or Generalized Additive Models (GAM) were applied to the historical series (2001-2022), to detect the rates of change of each indicator within each grid cell (0.2 x 0.2) as decreasing, stable or increasing.

Our results revealed a MTL decline associated with the continental shelf, particularly with regard to "all community" and TL≥2 scenarios. By contrast, the slope showed signs of recovery, when considering only top predators (TL≥4) in the analysis. These insights were cross-checked with the results from the Trophic Heterogeneity indicator to improve our ability to detect community wide changes at small spatial scales. Our study highlights the importance to develop trophic indicators aimed at improving the assessment of the food webs impacted by fishing practices.

Keywords: Trophic heterogeneity, mean trophic level, food web, spatio-temporal approach, Mediterranean marine ecosystems, trophic indicator, fishing impact

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CM 384: Research priorities of the deep-sea ecology in the Bay of Biscay

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Deep seas are extensive ecosystems hosting high biodiversity, although very fragile and threatened by the impacts of human activities and climate change. They play a key role in the global functioning of the planet, providing key ecosystem goods and services. Unfortunately, scientific knowledge of deep-sea ecosystems is limited. This is the case of the Bay of Biscay. This area is highly complex structurally with a great diversity of benthic niches, high biodiversity and productivity. In the context of the EPROCAN project (a project that has the support of the Biodiversity Foundation of the Ministry for the Ecological Transition and the Demographic Challenge), we conducted a questionnaire survey and a workshop with deep-sea experts of the Bay of Biscay. The outputs obtained allowed the identification of research priorities of the deep-sea ecology of the Bay of Biscay, including i) knowledge information gaps and scientific needs in the fields of biodiversity, ecosystem processes and functions, environmental impacts and risks, climate change, adaptation and evolution, environmental status and conservation including an analysis of deep-sea ecosystem representation within the existing marine protected areas network, and needs to define Ecologically and Biologically Significant Areas; ii) governance issues as in relation to the degree of collaboration between French and Spanish governments and the consideration of deep-sea ecosystem in the national spatial plans, and iii) future perspectives, in terms of research and other actions needed to ensure sustainable management. The outputs obtained will be presented during this session. The research will provide relevant information to set up the basis for future research and management of deep-sea ecosystems in the Bay of Biscay.

Keywords: Environmental change; mobility regimes; marine environment; borders; Ghana

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CM 386: A monitoring framework for Marine Protected Areas based on deep-learning images processing

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Marine Protected Areas (MPAs) are an important tool for the conservation of marine ecosystems and their constituent biodiversity components; monitoring plays a major role in the effective management of these MPAs. Within the European Natura 2000 network, Special Areas of Conservation (SAC) are subject to monitoring plans that must identify and establish their conservation status and define the evolution of the Habitats of Community interest present in the area. When dealing with large and deep MPAs, monitoring campaigns face a number of challenges, from sampling design to logistical complexity, among others. To address these issues, and considering the characteristics of the habitats under study, biannual benthic image surveys using a photogrammetric ROTV at fixed sampling stations covering key habitats was proposed as an optimal method for monitoring vulnerable ecosystems in deep sea areas, allowing a homogeneous and comparable sampling over time. This study presents the analysis of a multitemporal dataset (2017-2019-2021) based on images covering 3 monitoring stations focused on the 1170 reefs habitat of the European Habitats Directive within a MPA in the Cantabrian Sea. Deep learning techniques were used to automatically analyze and classify the content of the images. A variation of the LoFTR (Local Feature matching with TRransformers) model, based on the matching of small features between images, was used to correlate video frames covering differentsampling zones; for the estimation of the true area covered in each image, a convolutional neural network, using the flight height of the ROTV as input, was created. Lastly, for species identification and location, a Detectron2 model, FasterRCNN+ResNeXt101, with a variant for semantic segmentation that allows us to count the pixels occupied by the object and extrapolate it to the real size of each species, were used. With this approach, we were able to obtain density data for different species representative of the 1170 habitat and thus estimate multiple ecological indices that allow us to evaluate the ecological evolution of these areas.

Keywords: Image analysis, ROVs, deep-learning, Marine Protected Areas

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CM 392: Use of distribution models to assess trawling impacts on *Funiculina quadrangularis* fields on the southern Bay of Biscay

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Seapen fields have been described as vulnerable marine ecosystems (VMEs) and are currently protected by international resolution such as UN resolutions or the OSPAR convention. *Funiculina quadrangularis* is the most abundant species of Pennatulacean presented in the trawlable grounds of the Cantabrian Sea and Galicia, although it usually appears at low densities, probably because of the high trawling intensity present in the area. Thus, highlight the importance of spatially characterize these communities in the region and understand better the impact of trawling on them is a key step to promote its protection and recovery. With this aim, Generalized Additive Models (GAMs) were applied in a two steps approach. First, the probability of the presence of *F. quadrangularis* was modelled using a binomial model. Second, the abundance of the species was modelled after removing the zeros from the data. Both models were finally combined to provide a final output showing the density distribution of *F. quadrangularis* in the area. Along with different environmental variables (i.e. depth, slope, sedimentological characteristics, and oceanographical information), the models included trawling as an explanatory variable. Furthermore, a hypothetical scenario without trawling was also applied to predict the suitable distribution of *F. quadrangularis* may be in the absence of pressure. The study identified trawling as a key driver for predicting the presence and abundance of *F. quadrangularis* in the Bay of Biscay. In addition, the alternative scenario without trawling showed suitable areas where the species was currently unsuitable because of trawling. These potential suitability areas of *F. quadrangularis* found in this study can be useful for management purposes as areas to preserve in the future implementation of the different directives related to seabed protection.

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Keywords: sea pens, southern Bay of Biscay, bottom fishing, distribution models, VMEs, benthic habitats

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CM 394: Dynamic harvest control rules based on recruitment levels to manage stocks of uncertain productivity: application to Iberian sardine

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Fishery science is increasingly aware of the many environmental factors which may affect productivity of fish resources, implying changes in biological reference points for management. Sardine around the Iberian Peninsula suffered repeated recruitment failures between 2006 and 2017 which caused a major decline of the resource abundance. ICES reviewed twice the reference points to accommodate to the likely low productivity of the stock. However, in recent years, the reduced fishing mortality and the occurrence of some good recruitments have supported a stock recovery, which may trigger a new revision of the productivity scenario.

The major link between stock productivity and biological reference points comes usually from the steepness of the stock recruitment relationship (SRR). Based on the relationship between steepness and F_{MSY} (or F_{MSY} proxies, such as F50%B0), we propose two dynamic harvest control rules (HCR) that set the fishing mortality based on the latest recruitment levels. The first rule, the Multilevel Recruitment based HCR, allows catches corresponding to a fishing mortality target taken as the weighted mean of the F_{MSY} (or F_{MSY} proxy) attributable to every recent level of recruitment (usually over the last 10 years), according to their deviation from a common SRR. The second rule, the Two-Level Recruitment based HCR, is devised for stocks showing occasional high levels of recruitment followed by several years of lower (regular) recruitments, as it is probably the case of the Iberian sardine stock.

The rules performance was tested for the Iberian sardine on the same basis as the one used to test the last management plan agreed by Spain and Portugal, adopting the Management Strategy Evaluation approach. Results showed that the proposed dynamic HCRs have similar or better performance in the long term in terms of catches at levels of risks similar to those in the agreed management plan. Retrospective analysis of their performance since 2013 revealed that both rules would have produced consistent advice with those given by ICES from 2014 and 2020, but would have advised higher fishing mortality values since 2021, as a result of the recent increase of recruitment levels. The capacity of these HCRs to accommodate changes in the productivity of stocks, as reflected in the recruitment levels, would make them suitable for the management of stocks with uncertain productivity.

Keywords: dynamic HCRs, Iberian sardine, management strategy evaluation, productivity

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CM 439: Overcoming fish surveys limitations to model spatial-temporal distribution

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Understanding and foreseeing changes in species distribution is important for the management of marine resources and biodiversity. However, spatial-temporal knowledge of marine species is often restricted by limited coverage of scientific surveys which, due to high costs, are usually carried out once a year. This makes it a challenge to identifying trends and drivers. Adding complexity, the need to investigate likely changes in the spatial segregation during specific ontogenetic processes, some of them very relevant for management as recruitment and spawning, forces to a better temporal resolution.

This study is focused, through the development of species distribution models, on the distribution of the spawning component of megrims, *L. whiffiagonis* and *L. boscii,* in the South of the Bay of Biscay and North Iberian Coast area. These species are not separated in the landings and management is carried out by a combined total allowable catch (TAC) and same technical measures.

We use fishing logbook and vessel monitoring systems (VMS) from the commercial fishing fleet and take advantage of a biological fisheries sampling program on board and on-shore to determine the species ratio and spawning component. More than 50.000 fishing trips of the bottom otter trawl fleet for the last ten years are used to investigate the spatially structure and environmental effects on species distribution as well as their temporal variation. This approach provides a temporal coverage wider than the performed by the Spanish research survey used to assess megrims in the area which only takes place around October each year.

This methodology used for the first time in the area allows to link ecological functions to management challenges and could be used to improve spatial management. In a context where climate change and fishery impacts modify the spatial distribution of marine species, the use of species distribution models based on this data could serve both to determine environmental drivers affecting species distribution and improve management procedures that are more robust to spatial and temporal complexities.

Keywords: species distribution model, VMS and logbook data, environmental drivers, scientific sampling

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CM 447: Assessing Bay of Biscay fisheries performance under the ecosystem-based fisheries management approach

Sonia Sánchez-Maroño[1], Dorleta García, Marga Andrés, Leire Ibaibarriaga

The Common Fisheries Policy (CFP) and the Marine Strategy Framework Directive (MSFD) are the main policies currently regulating the exploitation of fish stocks in European Union waters. In the last decades the management focus has moved from single-stock towards an ecosystem-based fisheries management (EBFM). While the CFP aims at exploiting fish stocks at levels consistent with achieving Maximum Sustainable Yields (MSY) with a low risk of stock depletion, the MSFD pursues maintaining Good Environmental Status (GES). The achievement of the CFP and MSFD goals can be quantitatively assessed using a variety of indicators: ecological (biological risks, sustainable harvest, bycatch of PET species, marine litter, carbon emissions…) and socio-economic (landings, profits, gross value added, salaries, employment, distribution of profits among fishing sectors…).

This study represents a holistic integrated assessment of the current management system of the main fisheries in the Bay of Biscay. The analysis was specifically focused on the French and Spanish mixed demersal fleet and the Basque pelagic fleet (characterized by a marked seasonality of the target species). Stochastic simulations were carried out using the FLBEIA model, parameterised for the fleets operating the Bay of Biscay using a multi-stock and multi-fleet approach. Stock-specific management strategies were tested using alternative scenarios related with fleet dynamics and implementation of the landing obligation. The status quo situation (with same effort as in the most recent years) was compared with alternative hypothesis about fleet dynamics (dynamics based on profit maximisation versus dynamics based on inertia to the historical behaviour). The novelty of this work lies in the fact that, in addition to the indicators commonly calculated in the MSE simulations (frequently stock-specific or fleet-based), some new ecosystem-oriented ones are included. Allowing, for example, to evaluate the ecosystem pollution (based on the expected amount of marine litter and carbon emissions from fisheries) or the ecosystem exploitation status (based on catches per km^2 per year, known as the Ryther index, that allows assessing if there is ecosystem overfishing). For each indicator the averages over 6-year periods (2025-2030, 2035-2040, 2045-2050) were calculated, as suggested by the most recent MSFD guidelines.

Keywords: Bay of Biscay, Ecosystem-based fisheries management, sequential fleet, mixed fisheries, demersal, pelagic, CFP, MSFD

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CM 473: Evaluation of alternative HCRs for a short living stock using an MSE framework: the case of the anchovy in the Gulf of Cadiz

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The anchovy (*Engraulis encrasicolus*) in the Gulf of Cadiz (GoC) has the typical biological features of short living species: very high growth rates and most individuals dying before reaching the age 3. These life history traits require specific approaches regarding stock assessment and management strategies, like a short time lag between the assessment and the implementation of the advice, and stock-specific custom-made Harvest Control Rules (HCRs). Following ICES guidelines for category 3 stocks, catch advice for the GoC anchovy is provided annually using the so-called 1over2 rule, which is implemented using a relative spawning stock biomass (SSB) value estimated with a GADGET assessment model. It has been shown for other short-living stocks that a constant harvest rate (*chr*) rule can be more productive while still being precautionary. ICES guidelines include the use of a *chr* rule for provision of advice, but its performance must be assessed in a Management Strategy Evaluation (MSE) exercise.

For the anchovy of GoC an MSE framework has been developed using FLBEIA (Fisheries Library for Bio-Economic Impact Assessments) to assess the productivity and precautionary level of a range of HCRs. Mimicking the actual protocol, a within year advice (end of first semester) has been simulated. The 1over2 rule was used as a base case to compare with. This rule was tested with and without precautionary buffer and biomass safeguard. As alternative management strategies, different *chr* rules were simulated with a wide range of constant harvest rates over the simulated period, with and without biomass safeguard. The performance of these HCRs was evaluated when uncertainty in biological processes, assessment errors and variability in fisheries processes were implemented.

The results supported the idea that the 1over2 rule leads to a decreasing trend in fishing catches over time not produced by a decrease in the stock biomass (i.e., underutilization of fishing opportunities). The simulations showed that a number of the alternative *chr* rules tested lead to higher average catch while still being precautionary. Current uncertainty in survey catchability was a key factor determining how precautionary a given HCR was, and especially, the degree of infra or over harvesting of stock productivity. In addition, the effect of other relevant factors was assessed, like a variable proportion of catch by season over the simulated period or a seasonal pattern in the annual individual body growth.

Keywords: Anchovy, Management Strategy Evaluation, Harvest Control Rule, stock assessment, risk assessment

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CM 476: Climate warming induces shifts in macroalgal communities in the south-eastern Bay of Biscay: an analysis of thermal traits and community trends

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Sustainable ecosystem services in the south-eastern Bay of Biscay are difficult to ensure due to fragmented governance of human activities. Climate warming is particularly significant in this region, with sea surface temperatures increasing at a rate 0.15-0.25ºC per decade since 1980. The region has also experienced extremely warm summers in the last two decades (2003, 2006, 2018, and 2020). Simultaneously, the region is shifting from canopy-forming to turf-forming macroalgal species. Whether these changes are linked to increasing temperature or other factors remain unknown. The shift in macroalgal communities may have significant impacts on key ecological processes, highlighting the need for detailed knowledge of the marine ecosystem and human activities to ensure compatibility with conservation efforts.

To better understand the impact of temperature on the marine ecosystem of this region, we investigated the community trends of 19 locations scattered along 100 km off the Basque Country coast over a period of 32 years, in the summers of 1991, 2008, 2013, and 2021-2022. We investigated over 100 algal species and used global open-access databases to characterize species' thermal traits and assess how macroalgal communities are responding to sea surface temperature increase alone. Specifically, we used species optimal temperatures to calculate the Community Temperature Index, an indicator of the average thermal preferences of the macroalgal species in the community. Our results indicate an overall increase in the Community Temperature Index, indicating a greater dominance of warm-affinity species in the region. Some locations acted as refuges for cold-affinity species due to local favorable conditions. Cold-affinity species decreased abundance and were eventually replaced by smaller, warm-affinity algal species. The result is a transition from temperate forest to algal turfs that may alter key ecological processes and ecosystem services in our coasts.

Our findings highlight the need for effective management and governance of the south-eastern Bay of Biscay to address climate warming and ensure sustainability of the temperate macroalgal forests and their provision of ecosystem services. This requires a detailed understanding of the marine ecosystem and human activities in the region. Specifically, we need to develop measures to mitigate the impacts of climate warming and implement strategies to preserve the macroalgal forests and associated ecosystem services. By doing so, we can ensure the continued provision of vital ecosystem services and safeguard the ecological health of this region.

Keywords: macroalgae, shift, warming, Bay of Biscay, degradation, community temperature index

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CM 502: Understanding the mechanisms behind the decline of anchovy size in the Bay of Biscay

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In recent years, a gradual decrease in anchovy average size (length and weight) has been observed in the Bay of Biscay. This trend does not appear to be related to fishing pressure and could have severe consequences both at ecological and socio-economic levels. Here we hypothesise that the transport of anchovy eggs and larvae off the continental shelf, with low predatory pressure, could favour the survival of individuals with different growth rates. This could explain, at least partially, the observed decline in anchovy size in this area. To test this hypothesis, the growth of anchovy juveniles was studied in four different years (2006, 2009, 2013 and 2014) based on otolith microstructure analysis. Additionally, the relationship between east-west Ekman transport and the average size of juveniles was analysed during the period 2003-2021. There were interannual differences in somatic growth rates among years. Individuals in 2006 and 2009 (with a mean total length higher than the average of the series) showed significantly higher growth rates than those observed in 2013 and 2014. In addition, a great variability in somatic growth was observed between individuals of the same length in 2013 and 2014. For the same age, differences in length were up to 40%, indicating that both faster growing juveniles and those with slower growth, and therefore more vulnerable to predation, would have survived until autumn. On the other hand, the linear models showed a highly significant relationship between the medians of the intensity of Ekman transport westward and mean juvenile length in autumn, explaining between 37 and 47% of the observed variability in length. The results show that an increase in the intensity of Ekman transport westward produces a decrease in the mean length of juveniles. Increasing the intensity of westward transport would reduce the time that larvae and juveniles remain on the continental shelf, with greater abundance of predators. Thus, a faster transport of these individuals towards oceanic waters would reduce the preferential mortality of those individuals with lower growth rates (as observed in 2013 and 2014) and, therefore, could explain, at least partially, the decrease in anchovy size observed in recent years.

Keywords: anchovy, Bay of Biscay, Ekman transport, growth, predation, size

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CM 509: Identifying the drivers that influence the price of Anchovy in Basque Country

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The anchovy of the Bay of Biscay fishery is one of the most important fisheries, from the economic and cultural perspectives, in Basque Country. Recently, the increase of the fuel prices, the displacement of anchovy landings to the west and the stagnation of the prices of anchovy landed in the Basque Country have impacted purse seiner fleet profitability. The fishing industry might benefit from an optimal fishing strategy, and for this purpose, we investigated the main anthropological factors impacting the pricing of anchovy and mackerel in the Basque country. This was done by analyzing the price of first sale notes from the Basque ports and identifying temporal trends, volume of sales and cumulative sales affecting the prices of these fishes. The data were analyzed using generalized additive models. The findings from the analysis showed a significant relationship between the price and the size of the fish, anthropological variables (Accumulated captures of the previous days in Kg, The captures of each day in Kg, annual accumulated landings per each landing port, TACs, number of buyers, Basque landings ports), the temporal variables (weekly frequency, Julian days). For the model, we employed forward selection based on AIC, residual plots, and smother plots created for continuous variables. Following a statistical analysis of the years 2013 to 2021, We found pricing pattern indices, showing that large anchovy sizes were significantly more expensive. Also, we noticed that prices decrease when both days catch rates and overall preceding day capture increase. Also, we found that prices increase as the number of buyers increases. Also, when TACs are low, prices increase. Also, early in the week, prices are elevated. Consequently, we conducted additional research to observe price behavior and its representativity in relation to some anthropological variables, including annual accumulated landings and landing ports, accumulated captures of the previous days in kg, and daily captures in kg. Additionally, we applied the same methodology to temporal variables (weekly frequency, Julian days). Following that, we will use that model to investigate which exploitation strategies can raise prices and create the ideal fishing calendar.

Keywords: Bay of Biscay, Anchovies, fish prices, Basque fishing ports, Anchovy sizes

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CM 518: Using biological traits for classifying benthic habitats sensitivity: helping policy decision makers in the future Aviles Canyon System SAC (Bay of Biscay)

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The Avilés Canyon System (ACS) is a complex natural system, constituted by three main canyons located in NE Atlantic Waters (Bay of Biscay). ACS was declared as Site of Community Importance (SCI) based on Habitat Directive 92/43/CEE. Further steps were performed to convert it in a Special Area of Conservation (SAC). In this context is necessary to specifically identify habitats and species that characterize these areas and understanding their functionality. All these actions are needed for achieving a sustainable usage of the biological resources, and to preserve biodiversity standing in this area. In this work we tried to achieve this goal by creating a sensitivity map, based on the biological traits of the species that constitute the communities identified in the ACS.

First, we identified and quantified the species sampled with different tools (otter trawl, beam trawl, photogrammetric sleeves and ROVs), then with ordination methods assemblages were obtained. Matrices of assemblages contained species and their abundance or biomass. These were used to calculate a weighting sensitivity index (SI) for each of these community based on the scores for ten traits i.e.: 1. Maximum body size, 2. Longevity, 3. Mobility, 4. Fixation to a substrate, 5. Benthic position, 6. Flexibility, 7. Fragility, 8. Feeding habit, 9. Growth, 10. 3-D construction. Scores ranging between 1 and 3 were assigned based on literature available or expert criterion. Afterward a traffic-light color-based map for suitable habitats was obtained.

SIs were calculated for the 13 communities identified inside the SCI of the ACS. SIs ranged between 93 (maximum value calculated for coral gardens with *Acanthogorgia* and *Thouarella)* to 52 (bathyal fine sands with *Actinauge richardi*). Habitats were classified as highly sensitive HS (values≥ 85), moderately sensitive MS (65<values<85), and scarcely sensitive SS (values <65). The HS were mapped in red spectrum, in this category 6 habitats were encountered, MS colored in yellow range indicating some activities could be potentially allowed and finally SS colored in the green range suggesting more possible activities allowed.

We created a simple, ready-to-use tool for obtaining visual indication of the sensitivity of the habitats in the ACS. Using of weighting in terms of biomass or density has the advantage for managing the future SAC helping to reach a balance between protection of the largest areas with higher environmental values as possible, allowing the sustainable use of the resources in areas with lower sensitivity. This approach could be used in other MPAs.

Keywords: biological traits, benthic habitats, habitats sensitivity, Special Area of Conservation (SAC)

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CM 543: A multidisciplinary study of the Capbreton canyon system for its proposed integration into the Natura 2000 network

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The LIFE IP INTEMARES project, Integrated, Innovative and Participatory Management for the Natura 2000 network in the Marine Environment, aims to achieve an efficiently managed network of Natura 2000 marine areas, with the active participation of the sectors involved and research as basic tools for decision making. The project involves various actions, including the designation of marine protected areas, scientific research, and the development of sustainable fishing practices. The A2.2 action focuses on the improvement of knowledge for the declaration of new marine areas due to their ecological importance. Three areas have been proposed on the basis of previous studies in order to complete the NR 2000, one of them being the Capbreton canyon system in the Bay of Biscay (Cantabrian Sea) including the associated pockmark fields. This study aims to develop a management plan for the Capbreton canyon that takes into account the conservation of biodiversity and the sustainable use of resources. This involves studying the canyon's ecology, identifying key habitats and species, and assessing human activities that may impact the ecosystem. As part of the A2.2 action, two oceanographic cruises were conducted in the Capbreton canyon in 2019 and 2020 to gather scientific data and assess the ecological status of the habitat of community interest. Some of the key activities undertaken during these multidisciplinary surveys include: 1) geomorphological and sedimentary characterization based on the detailed analysis of bathymetric and reflectivity data acquired by multibeam echo sounder and high-resolution parametric seismic profiles, 2) biological characterization through non-invasive visual systems, using different underwater vehicles and 3) data collection of benthic communities using sampling techniques like dredges, grabs, and corers. In addition, an evaluation of the fishing activity and footprint was carried out using the information obtained from the VMS data and other sources to assess human impact on the ecosystem. The integration of this data using species distribution models has allowed the characterization and mapping of vulnerable habitats under the Habitats Directive. Preliminary results showed the presence of 1170 reef and 1180 habitats, indicating the suitability of the area for a protection status. These results will be used to inform the development of a management plan for the Capbreton canyon system, including identifying areas that require protection and establishing fishing regulations that ensure the sustainable use of marine resources. Will also contribute to a better understanding of the ecological functioning of the canyon and the conservation of its biodiversity.

Keywords: RN 2000, Marine Protected Areas, vulnerable benthic hábitat, deep sea ecology

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CM 553: Assesing the economic costs and ecological benefits of spatial protection measures: the case study of SCI Avilés Canyon System

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The Site of community Importance (SCI) Avilés canyon system (ACS) is located off the north Spain coast and characterized by a great complexity, both structurally and in terms of its oceanographic dynamics. Such complexity, with depths between 54 and 4201 m defines a very productive ecosystem with high biodiversity values.

Based on spatial distribution modeling results obtained during the multidisciplinary project LIFE INTEMARES, a total of 14 benthic habitats were identified in the ACS. Some of them are included as priority habitats for conservation of the Habitats Directive (92/43/EEC) in the category "1170 Reefs" and 4 are included in the lists of the OSPAR Commission as threatened or declining habitats. Among these, it is particularly outstanding the presence of cold-water coral reefs on the walls and axes of the three submarine canyons.

The SCA is also an area of important fishing resources that are exploited mainly by bottom trawls (otter trawls and pair trawls), gillnets and longlines. Given the significant fishing pressure in the area, these three fishing modalities are highly specialized, deploying over different habitats based on its operational capacities and target species. This diversification of the deploying area minimize the potential conflicts resulting from the overlapping activities.

The present study aims to conduct the first assessment of zoning priorities on SCI to guide the spatial allocation of conservation priorities on the drafting of management measures applicable to the SCA. The objective is that these measures will ensure a high degree of protection of vulnerable habitats while minimizing as much as possible the negative effects on the important socio-economic activities of the area. To do that, the spatial distribution of the fishing effort and the landings and first sale prices were analyzed for the period 2015-2020. The habitat distribution maps with the conservation priority habitat were also used as input data. Finally, we tested a list of conservation options or zoning priorities by the estimation of a range of percentage of protection of vulnerable habitats and the socioeconomic consequences with the help provided by MARXAN decision support tool.

Keywords: marxan, fisheries yield, spatial models, special area of conservation

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CM 594: Exploring fauna behaviour using baited cameras in the pockmarks fields of Capbreton Canyon System (Bay of Biscay)

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Capbreton Canyon System (CCS) is currently under study on LIFE INTEMARES project for its proposal as a Site of Community Importance (SIC) under the EU Habitats Directive. In this study we used data obtained from five multiparametric benthic platforms (landers) incorporating baited cameras and sensors (pressure, temperature, and salinity) deployed in the Capbreton Canyon System (Southern Bay of Biscay) at depths of 287–905 m and images recorded from photogrammetric ROTV Politolana at a depth range from 400 to 1000 m during 2019 and 2020 INTEMARES surveys. A total of 7800 images were taken during an average of 24 h (23-28 h) recording in each lander deployment and almost 4 hours of video from ROTV were recorded covering 7 different pockmarks.

Twelve benthopelagic fish species (4 elasmobranchs and 8 osteichthyes) and eighteen invertebrate species were identified from lander images. The great fork-bearded (*Phycis blenoides*) and the blackmouth catshark (*Galeus melastomus)* were the most often observed among fishes. In the case of invertebrates, the gastropod *Colus* sp was recorded in all deployments. Three landers were situated inside a pockmark depression. Species attracted to the bait were not different from other areas of same depth range on sedimentary bottoms of the Cantabrian Sea. Comparison among faunal compositions from different sites indicated that depth is the main factor for grouping sampling stations. Higher species richness was observed in the deeper stations varying between 18 and 15 species respectively. Regarding the images obtained from ROTV seven different phyla were found highlighting the presence of mobile species. Highest abundance of benthopelagic fishes was given by the roughsnout grenadier *Trachyrincus scabrus* and two species of the genus *Hoplostethu*s (H. atlanticus and H. mediterrsaneus). In relation to the abundance of invertebrates, the urchins *Gracilechinus acutus* and *Araeosoma fenestratum*, and the crab *Chaceon affinis* stand out. Large areas with a high density of ceriantharia were also found. Cluster analysis did not show the existence of different assemblages between pockmarks. The present study provides a first approach to categorize megabenthic epifauna associated with pockmarks using non invasive methods such as baited underwater cameras and ROTV.

Keywords: lander, Capbreton canyon, baited camera, pockmark, benthic macrofauna

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CM 656: Demersales survey (1983-2023), 40 years monitoring the demersal resources and ecosystems of the Bay of Biscay

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The DEMERSALES bottom trawl survey on the Northern Spanish Shelf has been carried out every autumn since 1983, to provide data and information for the assessment of the commercial fish species and the ecosystems of the Bay of Biscay. Integrated in the International Bottom Trawl Surveys of ICES (IBTS) since 1990, this survey covers all the northern Atlantic coast of Spain, from the border with Portugal to the border with France. This multidisciplinary research effort has provided, throughout 4 decades, invaluable data to better understand the oceanography of this region and the relationship with the resources inhabiting the shelf. Initially intended exclusively as a fishery survey to evaluate the status of the stocks of the main commercial species caught by the Spanish fleet, this survey has evolved towards a holistic sampling able to deal with the multiple needs of the current ecosystem approach to the management of the marine ecosystems keeping its original goal, producing abundance indices to be used in the management of the demersal stocks. DEMERSALES was a pioneer across Europe in the sampling of all organisms caught during the survey, including benthic non-commercial species. This information on benthic invertebrates has allowed to highly increase our understanding of benthic habitats in the Bay of Biscay as well as to better evaluate the impact of bottom trawling on these ecosystems, a key step in the implementation of directives such as the Marine strategy Framework Directive. Furthermore, the stomach contents of a wide range of species (commercial or not) have been analysed on board providing a key insight of the food webs of this region. This survey is complemented with the sampling of oceanographic variables, marine litter, sediment or the observation of sea birds and cetaceans. The survey has provided data to hundreds of scientific papers and during its 40 years of existence has been the first contact with the scientific work at sea for many Spanish researchers from IEO and other research institutions, being a perfect “training campus” for generations of marine researchers. The current number of papers published based on the collected data during this survey, the money raising for research based on the information obtained in DEMERSALES and the quality of the research which is generated around this survey allow us to be very optimistic about the future of DEMERSALES and hope that we are able to celebrate “soon” another 40 years of this successful story.

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Keywords: bottom trawling, long-term monitoring, fishery evaluation, demersal resources, benthic habitats, Bay of Biscay

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